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10/040,548	01/04/2002	Katsuyoshi Matsuura	FUJ 99228 CON	3783

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EXAMINER	
LEE, HSIEN MING	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/040,548	MATSUURA ET AL.	
	Examiner	Art Unit	
	Hsien-Ming Lee	2823	

-- The MAILING DATE of this c mmunicati n appears on th cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12 and 14-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12 and 14-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Remarks

1. Applicant's cancellation to claims 1-11 and 13 is acknowledged.

2. Claims 12 and 14-28 are pending in the application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 12, 21, 23-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okutoh et al (US 6,201,271) in view of Chu et al. (US 6,287,637) and Kizilyalli et al. (US 6,548,854).

In re claims 12 and 21, Okutoh et al. in Fig.1 and related text expressly teach the claimed method of fabricating a semiconductor device having a ferroelectric capacitor, comprising the steps of:

- forming an active device element 3/4 (i.e. a transistor) on a substrate 1;
- forming an insulation film 6 (i.e. silicon oxide) over said substrate 1 to cover said active device element 3/4;
- forming a lower electrode layer 10/9/8 of said ferroelectric capacitor over said insulation film 6, wherein said lower electrode layer 10/9/8 includes depositing a Pt layer 10 and a Ti layer 8;

- forming a ferroelectric film 11 of PZT (i.e. a film of zirconate titanate of Pb, see col. 1, line32 and col.5, line 60) by sputtering (col.8, lines 15-19) on said lower electrode layer 10/9/8 as a capacitor insulation film of said ferroelectric capacitor;
- crystallizing said ferroelectric film 11 by applying a rapid thermal annealing (RTA) in an atmosphere containing a non-oxidizing gas (i.e. nitrogen) and an oxidizing gas (i.e. oxygen) (col.6, lines 6-11); and
- forming an upper electrode layer 15 on said ferroelectric film 11;

  wherein said step of crystallizing said ferroelectric film 11 is conducted by setting a composition of said atmosphere such that said atmosphere contains said oxidizing gas with a fraction of 1 to 20% in volume (the ratio of nitrogen to oxygen is 4:1, i.e. nitrogen is 80% and oxygen is 20%, col. 6, lines 10-11).

In re claim 12 (lines 11-12), Okutoh et al do not expressly teach that the crystallizing step is conducted under a reduced total pressure of from 1 Torr to 40 Torr.

However, Chu et al., in an analogous art of crystallizing the ferroelectric film utilizing the atmosphere containing non-oxidizing gas (i.e. inert gas) and oxidizing gas (i.e. oxygen), teach performing the crystallizing step under a reduced total pressure in a range of from 10^{-4} Torr to 100 Torr (col. 7, lines 25-28; col.8, lines 55-57), which is within the claimed range.

Therefore, it would have been obvious to one of the ordinary skilled in the art, at the time of the invention wad made, to perform the crystallizing step of Okutoh et al under the aforementioned pressure range, as taught by Chu et al., since by doing so it would satisfactory form the ferroelectric dielectric film having perovskite structure (col. 7, lines 2-5, Chu et al.).

In re claim 21 (lines 17-20), Okutoh et al do not teach the step, after said step of crystallizing said ferroelectric film, of oxidizing said ferroelectric film in an oxidizing atmosphere such that the density of pinholes formed in said ferroelectric film in said crystallizing step is reduced.

Chu et al., however, teach the step, after said step of crystallizing said ferroelectric film using a mixed ambient comprising argon and oxygen (col. 7, lines 37-39), of oxidizing said ferroelectric film in an oxidizing atmosphere, i.e. annealing said ferroelectric film in an oxidizing atmosphere of Ar/O2 then O2 (col.7, lines 29-40 and 62-65)

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention wad made, to include the additional step of oxidizing the ferroelectric film after performing the crystallizing step as taught by Chu et al. in the Okutoh's method, since by doing so it would improve ferroelectric performance. (col.7, lines 29-40, Chu et al.)

Still, Okutoh in view of Chu et al. do not expressly suggest that density of pinholes formed in said ferroelectric film in said crystallizing step is reduced as a result of the oxidizing or annealing step.

However, annealing or oxidizing step has been widely used as densification purpose, as evidenced by Kizilyalli et al, in which Kizilyalli et al teach annealing an oxide layer 5 including a ferroelectric layer 4 so that a densification, as result of the annealing, would remove defects in layers 3~5 (col. 2, lines 35-36 and 56-58 and col. 3, lines 24-26).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to oxidize the ferroelectric film in an oxidizing atmosphere as taught by Chu et al. after said step of crystallizing said ferroelectric film in Okutoh, since by doing so it

would densify the ferroelectric film, as indicated by Kizilyalli et al, which, in turn, would reduce defects including pin holes from the ferroelectric film.

In re claim 23, the aforementioned teachings of Okutoh et al in view of Chu et al teach that the non-oxidizing gas is selected from the group consisting of Ar, N2 and He (col.7, lines 29-32 and 62-65, Chu et al.; and col.6, lines 6-11, Okutoh et al.).

In re claim 24, the aforementioned teachings of Okutoh et al in view of Chu et al teach that the oxidizing gas is selected from a group consisting of O2 (col.6, lines 6-11, Okutoh et al .).

In re claim 25, the aforementioned teachings of Okutoh et al in view of Chu et al teach that the step of crystallizing the ferroelectric film is conducted by a rapid thermal annealing (RTA) process (col, 6, lines 6-11, Okutoh et al).

In re claim 26, the aforementioned teachings of Okutoh et al in view of Chu et al teach that the step of forming the ferroelectric film comprises the step of forming the ferroelectric film by a sputtering process (col.8, lines 15-19, Okutoh et al).

In re claims 27 and 28, the aforementioned teachings of Okutoh et al in view of Chu et al teach that the ferroelectric film has a perovskite structure (col.7, line 1, Chu et al.) and the ferroelectric film is a film of zirconate titanate of Pb (col. 1, line32 and col.5, line 60, Okutoh et al).

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable Cuchiaro et al. (US 6,165,802) in view of Zhu et al. (US 6,495,412) and Chu et al. (US '637) .

Cuchiaro et al. in Figs.1-5 and related text teach the claimed method of fabricating a semiconductor device having a ferroelectric capacitor 118, comprising the steps of:

- forming an active device element 110 on a substrate 102 (Fig.1);

- forming an insulation film 114 over said substrate 102 to cover said active device element 110 (Fig.1);
- forming a lower electrode layer 116/120 of said ferroelectric capacitor 118 over said insulation film 114, wherein said lower electrode layer 116/120 includes a layer part 116 containing Ti;
- forming a ferroelectric film of a PZT (perovskite structure) 122 on said lower electrode 120 as a capacitor insulation film of said ferroelectric capacitor 118 (Fig.1);
- crystallizing said ferroelectric film 122 by applying a rapid thermal annealing process (step 226 in Fig. 2) (col. 8, lines 21-22) in an atmosphere of an oxidizing gas such as oxygen (col. 8, lines 20-30); and
- forming an upper electrode layer 124 on said ferroelectric film 122 (Fig.1)

Cuchiaro et al. do not expressly teach that the step of crystallizing the ferroelectric film is conducted by supplying O2 controlled to cause an oxidation in the Ti atoms reached a surface of the lower electrode from the layer part containing Ti atoms as said oxidizing gas (claim 14, lines 15-18).

Zhu et al., however, in an analogous art of forming the ferroelectric capacitor, suggest that Ti atoms would migrate from the underlying adhesion layer (Ti) to the top surface of the lower electrode (Pt) and form chemical compound (i.e. TiOx) when the lower electrode and the Ti adhesion layer are subjected to RTA process (col.13, lines 46-51).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to recognize that Cuchiaro et al. do inherently teach the aforementioned limitations, since the lower electrode layer 120 (Pt) is consecutively formed on the Ti layer 116

and Ti atoms from the layer 116 would migrate to the surface of the layer 120 during the crystallizing step.

In other words, as the ferroelectric film 122 is subjected to the thermal annealing (i.e. RTA) for the crystallization the underlying adhesion Ti layer 116 and the lower electrode 120 are also exposed to the elevated temperature in the thermal annealing process. This would cause Ti atoms migrating from the Ti layer 116 to the top surface of the lower electrode 120 and form the TiOx, i.e. cause the oxidation in the Ti atoms reached a surface of the lower electrode 120 from the Ti layer 116 as claimed.

Still, Cuchiaro et al. in view of Zhu et al. do not teach crystallizing said ferroelectric film by applying a thermal annealing process in an atmosphere of containing *an inert gas* and an oxidizing gas (claim 14, lines 11-12).

Chu et al., however, teach crystallizing the ferroelectric film by applying the thermal annealing process in an atmosphere of containing an inert gas (i.e. argon) and an oxidizing gas (i.e. oxygen) (col. 7, lines 37-39).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to crystallize the ferroelectric film of Cuchiaro et al. in view of Zhu et al. in the atmosphere containing inert gas and oxidizing gas, as taught by Chu et al., since by doing so it would benefit the crystallization of the ferroelectric film.

6. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable Cuchiaro et al. (US 6,165,802) in view of Izuha et al. (US 6,060,735).

In re claims 15 and 16, Cuchiaro et al. also teach the claimed semiconductor device, comprising:

- a substrate 102;
- an active device element 110 formed on the substrate 102;
- an insulation film 114 provided over said substrate 102 to cover said active device element 110;
- a lower electrode 116/120 containing Pt 120 provided over said insulation film 114;
- a ferroelectric film of a PZT (perovskite structure) 122 provided on said lower electrode 120; and
- an upper electrode 124 provided on said ferroelectric film 12.

Cuchiaro et al. do not teach that said ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said ferroelectric film essentially consisting of columnar crystal grains extending continuously from a bottom surface of said ferroelectric film to a top surface of said ferroelectric film and having a substantially uniform grain diameter of less than about 200 nm (claim 15, lines 8-14).

However, Izuha et al. (Figs. 1-7), in an analogous art, teach the claimed semiconductor device, comprising a semiconductor substrate 1; a lower electrode 4 provided over the semiconductor substrate 1 having **columnar grains (a) near vertical direction to the surface of the substrate1** (col. 5, lines 7-10); a ferroelectric film 5 on said lower electrode 4 (Fig.1), said ferroelectric film 5 (perovskite structure such as PZT; col. 4, lines 52-53) having a **columnar grains (b)** extending from an interface between said lower electrode 4 and said ferroelectric film 5 (Fig. 4A) in a direction substantially **perpendicular to** a principal surface of said lower electrode 4 (col. 2, line 57 through col.3, line 45 and col. 5, lines 10-12), said ferroelectric film 5

essentially consisting of **columnar crystal grains (b)** extending continuously from a bottom surface of said ferroelectric film 5 to a top surface of said ferroelectric film 5 (col. 5, lines 10-12) and having a substantially **uniform grain** diameter of less than about 200 nm (i.e. 5~500 nm, col. 6, lines 52-53); and an upper electrode 6 provided on said ferroelectric film 5; wherein said lower electrode 4 comprises a Ti layer and a Pt layer (col. 4, lines 37-45).

Therefore, one of ordinary skill in the art, at the time the invention was made, would have been motivated to provide the semiconductor device of Cuchiaro et al., including the ferroelectric film, having a columnar microstructure extending from an interface between the lower electrode; and the ferroelectric film in a direction substantially perpendicular to a principal surface of the lower electrode, as taught by Izuha et al., with a reasonable expectation of success because Cuchiaro et al. and Izuha et al. are providing similar ferroelectric capacitor and by this manner it would provide the semiconductor device having a better dielectric breakdown resistance. (col.20, lines 55-60, Izuha et al.)

In re claims 17 and 18, the aforementioned teachings of Cuchiaro et al. in view of Izuha et al. also teach that the lower electrode 116/120 comprising a Ti layer 116 and a conductor layer 120 (i.e. Pt) provided on the Ti layer 116.

In re claims 19 and 20, the aforementioned teachings of Cuchiaro et al. in view of Izuha et al. also teach that the ferroelectric film has a perovskite structure and comprises a zirconate titanate of Pb (col.5, lines 52-57, Cuchiaro et al.).

7. Claims 22 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Okutoh et al (US '271) in view of Chu et al. (US '637) and Kizilyalli et al. (US '854), as applied to claim 21 above, and further in view of Cuchiaro et al. (US '802).

Okutoh et al in view of Chu et al. and Kizilyalli et al. teach all the claimed limitations as stated above, including lower electrode layer 10/9/8 includes depositing a Pt layer 10 and a Ti layer 8 (Okutoh et al.), but do not teach depositing the Ti layer and the Pt layer consecutively.

However, Cuchiaro et al., in an analogous art of forming a ferroelectric capacitor, teach forming a lower electrode layer 116/120 includes depositing a Ti layer 116 and a Pt layer 120 consecutively (Fig.1).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention wad made, to modify the forming step of the lower electrode of Okutoh et al (US '271) in view of Chu et al. and Kizilyalli et al. by consecutively depositing the Ti layer and the Pt layer as taught by Cuchiaro et al, since by doing so it would improve the adhesion between the lower electrode and the underlying insulation film (col.4, lines 61-65, Cuchiaro et al).

Response to Arguments

8. Applicant's arguments filed 8/8/03 have been fully considered but they are not persuasive for the reasons as follow.

In re claims **12, 21 and 23-28**, applicant argue that Okutoh combined with Chu do not teach or suggest the claimed pressure range as recited in claim 12; and there is no motivation to combine Okutoh with Chu relating to use of a reduced oxygen pressure during the crystallization process of the ferroelectric film.

Contrary to the arguments, Okutoh combined with Chu **does** teach the claimed pressure range as recited in claim 12 (i.e. from 1 Torr to 40 Torr), as stated in this Action, page 3. The motivation/suggestion for combining is to satisfactory form the ferroelectric dielectric film having perovskite structure (col. 7, lines 2-5, Chu et al.). In particular, Chu et al. suggest that the

satisfactory ferroelectric dielectric film cannot be obtained unless O2 partial pressure in the crystallizing step is controlled (col. 7, lines 1-5) ranging from 10^{-4} Torr to 100 Torr (col. 7, lines 25-28; col.8, lines 55-57), which is within the claimed range. With this reduced O2 pressure range, O2 vacancies would provide effective path for lead cations to migrate in the ferroelectric dielectric film, giving rise to a uniform lead distribution and homogeneous formation of the perovskite phase (col. 7, lines 6-10, Chu et al.)

Applicants also argue that neither Okutoh nor Chu teaches or suggests the existence of the pinholes in the ferroelectric film or decrease of the pinhole density as a result of the oxidizing step conducted after the crystallizing step.

In response to the argument, the limitations have been considered but are moot in view of the new ground(s) of rejection. Kizilyalli et al remedy the deficiency. Kizilyalli et al. teach annealing an oxide layer 5 including a ferroelectric layer 4 so that a densification, as result of the annealing, would remove defects in layers 3~5 (col. 2, lines 35-36 and 56-58 and col. 3, lines 24-26). In other words, annealing or oxidizing step has been widely used as densification purpose; and one of the ordinary skill in the art would have been recognize that the densification as result of the oxidizing or annealing would reduce defects of the ferroelectric film and densify the ferroelectric film, which implies reducing any voids density or pinhole density in the ferroelectric film .

In re claims **14**, applicant argue that Zhu would not remedy the deficiency of Cuchiaro et al. because Zhu teaches annealing the lower electrode in a pure Ar atmosphere separately from the crystallization process of the ferroelectric film, which would result in peeling problem.

In response to the argument, Chu et al. reference is used to remedy the above deficiency.

Chu et al., teach applying the thermal annealing process in an atmosphere of containing an inert gas (i.e. argon) and an oxidizing gas (i.e. oxygen) (col. 7, lines 37-39) for improving the crystallization of the ferroelectric film, as stated above. Thus, the combination of Cuchiaro et al. (US '802), Zhu et al. (US '412) and Chu et al. (US '637) read on all limitations of claim 14. In addition, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In re claims **15-20**, applicants further argue that FIG. 4A in Izuha is a schematic representations only, not illustrating literal relationships, because all the columnar crystals in FIG. 4A have the substantially same diameter; and it is factually impossible to have a real ferroelectric capacitor with the structure of FIG. 4A in which the grain diameter is the same among all the crystals constituting the ferroelectric film.

In response to the arguments, Izuha not only demonstrates the columnar grains in Fig. 4A but also expressly describes related properties of the columnar grains in column 2, line 57 through column 3, line 45, column 5, lines 7-12 and abstract. In particular, Izuha suggests that columnar grains A, including columnar grains a in lower electrode 4, columnar grains b in ferroelectric dielectric film 5, and columnar grains c in upper electrode 6; and all the columnar grains a, b and c are substantially perpendicular (i.e. vertical) to the surface of the substrate (col. 5,lines 3-11); and all columnar grains in different layers 4, 5, and 6 are lattice matching, which prevent leak current from occurring in the thin film dielectric device (abstract). With Izuha's teachings, one of the ordinary skilled in the art would have recognize that it reads on the claimed

limitations "ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said ferroelectric film essentially consisting of columnar crystal grains extending continuously from a bottom surface of said ferroelectric film to a top surface of said ferroelectric film and having a substantially uniform grain diameter of less than about 200 nm", as stated above.

With regard to applicant's questioning on the validity of the Izuha's patent, which is issued by U.S. Patent Office, applicant is invited to provide factual evidence demonstrating that it is "impossible to have a real ferroelectric capacitor with the structure of FIG. 4A."

In re claim **22**, applicants also argue that "[n]one of Okutoh, Chu or Cuchiaro teaches or suggests the existence of the pinholes in the ferroelectric film or decrease of the pinhole density as a result of such an oxidizing step conducted after the crystallizing step."

In response to the argument, it is mistaken to indicate that the aforementioned combined teachings does not suggest decreasing of the pinhole density as a result of such an oxidizing step conducted after the crystallizing step even though "pinholes density" does not literally appear in the cited references. As indicated previously, the oxidizing or annealing has been widely for film densification purpose, as evidenced by Kizilyalli (US '854). As result of the densification, voids or pinholes in the film would diminish.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

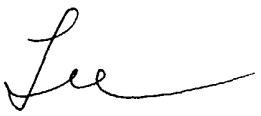
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
Art Unit 2823



Nov. 5, 2003